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(19)(CA) **APPLICATION FOR CANADIAN PATENT** (12)

(54) Disk Type Recording Medium

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# DISK TYPE RECORDING MEDIUM

## BACKGROUND OF THE INVENTION

[Field of the Invention]

The present invention relates to a disk type recording medium proper for a magnetic optical disk and the like.

[Prior Art]

In an optical disk apparatus and like to be used as a data recording/replaying apparatus, for example, an AV server that stores transmitted audio data and video data and processes them in a predetermined manner, there are two types, one being a manual type where a user exchanges a disk as a data recording medium and the other one being an automatic type where the disk is automatically exchanged by a mechanism. In general, the latter is an automatic disk exchanging apparatus called as a changer.

The changer stores plural disks (bare disks without protection cases). A disk carrying is provided at the changer to pick up a requested disk from a box (bin) of storing the plural disks, carry it to a tray (disk tray) of a disk drive apparatus and receive the disk from the try for returning it to the box.

Figure 18 is a plan view of a disk drive apparatus for explaining to exchange the disks in a conventional manner and Figure 19 is a side view along an arrow IX. As shown in Figure 18, a spindle 72 is provided at a center of a base 71 of the disk drive apparatus for driving to rotate the disk 10 and a magnetic chuck type turning table is mounted to the spindle 72. The disk trays 73 are mounted at both sides of the spindle 72 at a center to hold the disk 10 and carry it upward and downward.

The disk trays 73 provided at both the sides of the spindle 72 have the same configuration where, as shown in Figure 19, each the disk tray 73 is supported by a pole 74 projected from the base 71. Each the disk tray can move along a disk attaching/removing direction (vertical direction in Figure 19) at right angles with the rotation surface of the disk 10 and is biased upward by compression springs 75.

These disk trays 73 couple with opposite parts of the outer circumference of the disk 10 (crosshatched areas in Figure 18) for supporting them. When the disk trays 73 are elevated, the disk 10 supported by the disk trays 73 is positioned at an upper position of the spindle 72 as shown in the right half of Figure 19. When the disk trays 73 moves downward against the spring force of the compression springs 75, the disk trays 73 is positioned at the lower position than the disk 10 put on the turning table 70 as shown in the left half of Figure 19.

A pressing board 76 is provided at a position higher than the spindle 72 and the disk trays 73 to cover them as shown by in Figure 18 where a part of the pressing board 76 is cut. As illustrated in Figure 18, the pressing board 18 has left and right edge portions supported by side plates (not shown) and can be moved by a driving device (not shown) along the disk mounting/removing direction (vertical direction in Figure 19). Pushing pins 77 are fixed on portions of the pressing board 76 that face the disk trays 73. When the pressing board 76 moves downward, it touches the disk trays 73 to push them downward against the spring force of the compression springs 75.

A disk hand 78 for the changer comprises a pair of supporting rods and four claw type trays (hand trays) 80 mounted to face the spindle

72 where each rod 79 has two fixed hand trays 80. The disk 10 can be mounted on four hand trays 80. As illustrated in Figure 20, the rods 79 are driven by the driving device (not shown) such that they can enter, exit and move upward and downward in a space between the base 71 and the pressing board 76.

In such a conventional apparatus, the disk 10 would be exchanged with respect to the spindle 72 as follows. For mounting the disk 10, the disk 10 is put on the hand trays 80 of the disk hand 78 as shown in Figure 20. Then, the disk 10 enters the space between the base 71 and the pressing board 76 to be positioned between the disk trays 73 and the pressure board 76 as shown in Figure 19. When the disk 10 reaches the predetermined position, the disk 10 moves downward and is received by the disk trays 73. Then, the disk hand 78 is removed (the right half of Figure 19 and Figure 20).

After that, the pressing board 76 is moved downward by the driving device such that the pressing pins 77 push the disk trays 73 to a lower position. In these processes, the disk 10 is put on the spindle 72 (left half of Figure 19). The disk 10 is chucked by the magnet chuck type turning table 70 provided at the spindle 72. Then, it is complete to mount the disk 10.

Before removing the disk 10 from the turning table 70, the pressing board 76 is moved upward. While disk trays 73 are moved upward by the spring force of the compression springs 75, the disk trays 73 get the disk 10 from the spindle 72 by overcoming the magnet attachment power of the turning table 70. This condition is shown in the right half of Figure 19. Then, the disk hand 78 enters the space between the base 71 and the pressing board 76 through the lower position inversely to the mounting

process. The disk hand 78 is moved upward to receive the disk 10 from the disk trays 73 and removed with the disk 10 from the space between the base 71 and the pressing board 76.

The disk 10 may be a magnetic optical disk for recording and replaying signals, such as data or an optical disk only for replaying the data. Figure 21 shows a construction of such disk 10.

As can be understood from Figure 21 and Figure 22 that is a side view thereof, glass having a small coefficient of linear expansion is used as a medium substrate 1 of the disk 10. Grooves used for a tracking control, pre-format portions to which a disk management signal, a control signal etc. are recorded beforehand, and the like are formed on one surface of the glass substrate 1 by two process steps with hot polymer, and a recording film 2 as a signal recording portion is coated and formed on the recording film 2 by spattering. A protection substrate 3 is coated and formed on the glass substrate 1 by adhesive in order to protect the recording film 2. A reference number 5 represents the adhesive layer. A chucking type hub 4 is provided at the center portion of the glass substrate 1 and it is carried such that the upper side thereof faces the turning table 70 in the example of this drawing.

In the prior art, the protection substrate 3 as a protection member is provided to protect the recording film 2 formed on the glass substrate 1. Since the diameter of the protection substrate 3 is equal to that of the glass substrate 1, the glass substrate 1 cannot be protected enough. For example, when the outer edge of the glass substrate 1 hits against a fixed object while handing the disk, the glass substrate 1 may crack by the shock or be damaged in the worst so that it cannot be available.

## SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention to provide a disk that overcomes the aforementioned disadvantages of the prior art, improves the shock proof characteristic against the shock from the outer circumference of the substrate and improves reliability of the disk.

The present invention is the disk type recording medium having at least a single disk type recording medium substrate with one surface as a signal recording section. The disk type recording medium comprises a protection member for protecting the recording portion and having a circumference portion corresponding to the outer circumference portion of the recording medium substrate, and a rib member provided at the outer circumference edge of the recording medium substrate to face it.

The scope of the present invention will be understood by reference to the following detailed description. However, the following description will be made only on preferred embodiments and it is apparent for those skilled in the art that various modifications and changes can be made without departing from the scope and sprit of the present invention.

## BRIEF DESCRIPTION OF DRAWINGS

This invention may best be understood by reference to the following description and the drawings of the embodiments. However, these drawings are sued as terms of description and not of limitation.

Figure 1 is a perspective view of one embodiment of a recording medium to which the present invention is applied.

Figure 2 is a cross sectional view of Figure 1.

Figure 3 shows that a recording side of the recording medium

touches a mounting surface.

Figure 4 is a magnified view of an A portion in Figure 3.

Figure 5 is a magnified view of a part of a protection rib.

Figure 6 shows a relation between a hand side tray and a disk.

Figure 7 shows a relation between a driver side tray and the disk when the disk is set properly.

Figure 8 shows a relation between the driver side tray and the disk when the disk is set reversely.

Figure 9 shows a relation between the driver side tray and the disk when the disk is not set properly.

Figure 10 shows a circuit diagram of one embodiment of a front/back determining sensor.

Figure 11 shows a characteristic curves between a sensor output and a disk distance.

Figure 12 shows a block diagram of one embodiment of a front/back determining processing apparatus.

Figure 13 is a partially cross sectional view of another embodiment of the recording medium.

Figure 14 is a partially cross sectional view of an additional embodiment of the recording medium.

Figure 15 is a partially cross sectional view of the recording medium having both sides on which the data can be recorded.

Figure 16 is a partially cross sectional view of an embodiment of a cartridge reception type recording medium.

Figure 17 is a partially magnified view of Figure 16.

Figure 18 is a plan view of an example of a main part of a disk replaying apparatus.

Figure 19 shows a tray elevation condition.

Figure 20 shows a relation between a had and a driver.

Figure 21 is a perspective view of the recording medium.

Figure 22 is a cross sectional view of Figure 21.

## DETAILED DESCRIPTION OF THE INVENTION

The recording medium according to the present invention will be discussed in detail by reference to the attached drawings where the invention is applied to the above disk recording/replaying apparatus.

Figure 1 is a perspective view of one example of the recording medium 10 according to the present invention. In this embodiment, the recording medium 10 is a magnetic optical disk. The recording medium will be refer to as only a disk.

A medium substrate 1 may be a disk type glass substrate having a small coefficient of linear expansion and a recording film 2 is uniformly coated and formed on a predetermined area of one surface of the glass substrate 1 by spattering. A protection substrate 6 is put on the glass substrate 1 to cover the recording film 2 so that they become one body. A chuck type hub 4 is provided at the center portion of the glass substrate 1. The hub 4 is slightly projected from the surface of the glass substrate 1. The adhesive may be a hot melt type adhesive, both side adhesive tape and the like.

The outer circumference edge (edge portion) of the glass substrate 1 is covered by a protection rib 7. In this embodiment, the protection rib 7 may be a flange formed at the outer circumference of the protection substrate 6 as one body. The length La of the protection rib 7 is slightly longer than a length Lb from the common surface to that of the glass substrate 1 as shown in Figure 4. A difference a therebetween is about 1.5mm at the maximum but the 0.5mm is applied in this embodiment.

The protection rib 7 absorbs the shock applied from the outside and the shock is not given directly to the glass substrate 1. Thus, the glass substrate 1 is protected not to be damaged by the shock. When the disk 10 is put on a mounting surface 8 such that the glass substrate 1 is at the lower side as shown in Figure 3, the glass substrate 1 does not touch the mounting surface 8 as shown in Figure 4 because the protection rib 7 and the hub 4 are projected slightly from the surface of the glass surface 1. Therefore, the shock would not be given directly to the glass substrate 1 when mounting it.

The protection substrate 6 may be made of polycarbonate resin or ABC resin. Since the material of the protection substrate differs from the glass substrate 1, the coefficients of linear expansion thereof may differ from each other under a usage temperature. When the glass substrate 1 extends and the outer circumference thereof touches and pushes the inner circumference surface of the protection rib 7, the shapes of the glass substrate 1 and the protection substrate 6 may be modified. For taking measures to avoid such a modification, there is a space b (about 0.5m) between the glass substrate 1 and the protection rib 7 as illustrated in Figure 4. A thickness of the protection rib 7 may be about 1.0mm.

Figure 5 shows the protection rib 7 in detail. As shown in this drawing, the outer circumference edge of the protection rib 7 comprises a straight portion 7a and a taper portion 7b that extends from the portion 7a. The dimensions thereof depend on a relation between the hand tray 80 and the disk trays 73 for handing the disk 10. The taper portion 7b is useful when it is removed from a metallic mold at a process of forming the protection substrate. In a resin molding, an outer surface 6a is formed at a cavity side of the metallic mold and a hollow portion 6b is formed as a core. The taper portion is formed at the core side so that the removing

process from the metallic mold is improved.

In a case that the disk 10 is moved from and to the bin or is carried to the driving device, the disk hand 78 shown in Figure 18 is moved quickly along the arrow direction of Figure 20. Thus, the disk 10 receives a relatively large acceleration in the hand trays 80 and the disk trays 73.

The hand tray 80 comprises a taper portion 81 of an inner surface and a bottom portion 82 and a step portion 83 supports the disk 10 as illustrated in Figure 6. The inner surface taper portion 81 is formed so that the disk 10 slides smoothly to the step portion 83 even if the handling operation of the disk 10 is not proper and the disk 10 is received by the outside of the step portion 83. Since the protection rib 7 has the taper portion 7b, it is more easy to hold the disk 10 in the step portion 83.

A mounting position of the hand tray 80 with respect to the disk 10 and the dimensions thereof are properly selected as follows such that the straight portion of the inner surface of the step portion 83 touches closely the straight portion 7a of the protection rib 7. However, the following values are one example where the disk 10 is an eight-inch disk.

length A of the rib 7 = 2.6mm
length B of the taper portion 7b of the rib 7 = 1.1mm
length (A-B) of the straight portion 7a of the rib 7 = 1.5mm
length C of the step portion 83 = 2.2 mm

Therefore, the length D of the touching area of the straight portion 7a of the protection rib 7 and the straight portion of the step portion 83 is 1.1mm. Since the contact length D is equal to or larger than

1mm, the disk 10 would not be removed from the hand trays 80 even if the hand 78 is moved rapidly in an arrow direction p by the access operation for exchanging the disks and the disk 10 receives a force along the arrow p in the hand trays 80. Therefore, an stable operation can be established for the high speed access of the hand 78.

Figure 7 shows a relation between the disk 10 and the disk tray 73 provided at the drive device. In this drawing, the disk tray 73 comprises an inner surface taper portion 86, a bottom flange 87 and a straight coupling step 88 therebetween. The coupling step portion 88 acts to mount the disk 10 properly on the disk trays 73 without tremble. Similarly to the above discussion, the inner surface taper portion 86 is formed such that the disk 10 falls in the step portion 88 and is held within a range of the inner surface taper portion 86 even if the disk 10 is not properly passed to the trays 73.

It is better that a thickness E of the disk tray 73 is thin as much as possible in order to make the apparatus to be compact. In this embodiment, a length L of the step portion 88 is selected to be 1.0mm. On the other hand, a dimension of the taper portion 7b provided at the protection rib 7 is 1.1mm and it is tapered. If the taper angle of the taper portion 7b is large or a roundness R of a corner portion for the taper portion 7b is large, a gap value K between the disk 10 and the disk tray 73 (distance between the surface of the coupling step portion 88 of the disk tray 73 and the protection rib 7) becomes large. Thus, the positioning accuracy of the disk 10 may be reduced with respect to the turning table 70.

In the embodiment of Figure 5, the maximum taper angle of the taper portion 7b is 1.0 degree and a dimension G of the corner portion R is less than 0.2mm. Since there values are selected, the gap K of the disk 10

is very small and it is easy to position it.

In Figure 7, an opening 89 is provided at a predetermined position of the bottom flange 87 and a sensor 90 is provided therein for determining a front or back side of the disk 10. The front/back sensor 90 may be a reflection type optical sensor.

The front/back determining sensor 90 determines the front or back side of the disk 10 in accordance with an optical reflection rate of the disk 10 mounted on the disk trays 73 where the optical reflection from the front side of the disk differs from that from the back side thereof. In this embodiment, the reflected light from the glass substrate 1 is strong but the reflected light from the protection substrate 6 is weak. Since the reflection rate of the glass substrate 1 is very high, a special modification is not needed. However, the protection substrate 6 should be modified as follows in order to make the reflected light weak.

The substrate material for the protection substrate 6 is the polycarbonate resin and colored black. As illustrated in Figure 5, the outer surface 6a of the protection substrate 6 is treated by a scratch-brush finish in order to make the outer surface to be rough. The scratch-brush finish may be completed by a blast process with, for example, count #80. The scratch-brush finish may be applied to a part or all of the surface. The treated part should be an area (band area) of the disk 10 to which the detection light is emitted when the disk 10 is set properly. If all the surface is treated, the scratch-brush finish is applied to the area except for the most outer circumference area (substantially equal to the width of the rib 7) 6c. If the scratch-brush finish is applied to the most outer circumference area 6c, cross burr occurs on the outer circumference surface and the finishing process may be required to remove the cross burr.

However, the width of the most outer circumference area 6c is better to be narrow as much as possible. When the width of the most outer circumference area 6c is too wide, the most outer circumference area 6c receive the detection light even if the disk 10 is mounted properly. This may result in an error detection.

The detection light should be emitted to the inside of the most outer circumference area 6c even if the disk 10 is set on the disk trays 73 with the gap K as shown in Figure 7. For this purpose, the front/back detection sensor 90 is provided at a position inner than the distance M from the inner surface of the step portion 88 to the edge surface of the glass substrate 1 as shown in Figure 7.

The front/back determining sensor 90 is not proper to be provided at any inner position. However, the position thereof should be selected to be close the distance M as much as possible such that an improper setting can be determined when the disk 10 is offset to run on to the disk tray 73 by being set diagonally as illustrated in Figure 9.

When the disk 10 is properly set as shown in Figure 7, the glass substrate 1 side faces the front/back determining sensor 90 and the detected reflection light may be strong. If the disk 10 is set properly but the protection substrate 6 faces the sensor 90 because of the reverse condition as shown in Figure 8, the reflected light is weak. Thus, the front and back surface can be determined by detecting the intensity of the reflected light.

When the glass substrate 1 is a lower side but the disk 10 is not set properly as shown in Figure 9 where the bottom flange 87 touches the edge surface of the disk, the opposite disk edge surface strides over

the inner surface taper portion 86 formed at the other disk tray 73. In such a case that the disk 10 rides on the disk tray 73 and is offset by a value larger than the width of the inner surface taper portion 86 of the disk tray 73 (about 5mm in this apparatus), the front/back determining sensor 90 is positioned outside the disk 10 as illustrated in Figure 9. In this instance, the reflected light cannot be detected by the front/back determining sensor 90 provided at the disk tray 73 as shown in Figure 9. Since the other one of the front/back determining sensors 90 may not substantially detect the reflected light because it light value is very small, the improper setting condition may be detected by monitoring the sensor outputs.

Figure 10 shows an embodiment of the front/back determining sensor 90 acting as a reflection type sensor. In Figure 10, a light emitting device may be a light emitting diode 91 and a light receiving device may be a photo transistor 94. A drive voltage is applied to the light emitting diode 91 through a resistor 92. Similarly, the drive voltage is applied to the photo transistor 94 via a resistor 93. An output terminal 95 is derived from a common junction q of the resistor 93 and the photo transistor 94.

When the disk 10 is set properly such that the glass substrate 1 faces the sensor as shown in Figure 9, the reflected light from the disk 10 is strong and the detection output from the terminal 95 (the sensor output) is small (refer to a curve La of Figure 11). If the disk 10 is reversely set as illustrated in Figure 8, the reflected light is weak and the sensor output from the terminal 95 is large (see a curve Lb of Figure 11). The sensor output where the disk is not set properly as shown in Figure 9 is larger than that of Figure 8 (about 5V: refer to a curve Lc of Figure 11). The front and back setting and the improper setting are determined in accordance with a various of the sensor output levels.

Figure 11 shows a relation between the sensor output level and the distance from the front/back determining sensor 90 to the disk 10 in which the sensor output is most stable while the distance is 1-3mm. Therefore, the front/back determining sensor 90 is provided such that the distance maintains about 1mm when the disk 10 is mounted on the disk tray 73 properly. In the embodiment, the front/back determining sensor 90 is provided at the position lower than the surface of the bottom flange 87 as illustrated in Figure 7. The front/back determining sensor 90 is fixed to a mounting plate 96.

The operation of the sensor starts to determine the front or the back immediately before the disk 10 is completely mounted on the disk tray 73. For example, the sensor operation timing is when the disk is moved downward to a position separated from the bottom flange 87 by about 2mm.

Figure 12 is an embodiment of a processing apparatus 100 that determines the front or back condition or the improper setting condition. Since the drive device has a pair of disk trays 73 as shown in Figure 18, each disk tray 73 has an own front/back determining sensor 90 (90A, 90B). The sensor outputs Sa and Sb from the front/back determining sensor 90A and 90B are applied to respective A/D converters 101A and 101B to be converted into digital signals. The digitized pair of comparison outputs are applied to a microcomputer 103 operating as a control section. The microcomputer 103 processes in response to the comparison outputs under control of a software.

The microcomputer 103 sets two reference levels REFa and REFb shown by Figure 11. The first reference level REFa is used to determine the front or back side and the second reference level REFb is used to

determine the improper setting condition.

If the sensor outputs Sa and Sb are lower than the reference level REFa, the disk 10 is determined to be set properly as shown in Figure 7. If the sensor outputs Sa and Sb are larger than the first reference level REFa and lower than the second reference level REFb, the disk 10 is determined to be set reversely as shown in Figure 8. When the sensor outputs Sa and Sb are larger than the second reference level REFb, the disk 10 is determined to be set improperly as shown in Figure 9.

A driver 104 is controlled in response to the control output from the microcomputer 103 so as to control an up/down condition of an elevation mechanism 105 for the pressing board 76. The microcomputer 103 controls an on/off state of a lamp 106 and a display condition of a display device 107 such as an LCD.

When the disk 10 is set improperly without exchanging the front and the back thereof as illustrated in Figure 7, both the comparison outputs are the low level. Then, the elevation mechanism 105 for the pressing board is activated so that the disk 10 is mounted on the disk trays 73. In the case of Figure 8, the control output from the microcomputer 103 inhibits the pressing board 76 from being moved upward or downward. The lamp 106 generates an alarm (blinks) and the error display signal is produced such that the display section 107 displays the condition (for example, the reverse setting condition). The operator can do the appropriate post process in response to the indication and display. In the case of the improper setting condition shown in Figure 9, the pressing board 76 is prevented from being moved upward or downward, the alarm is indicated and the alarm display (for example, the running-on condition) is done.

Since the pressing board 76 is prevented from being elevated, the improper condition can be detected before the disk 10 is chucked to the turn table 70. Thus, the disk 10 is protected from being damaged. This is because the hub 4 of the disk 10 can be chucked only from the front surface side (recording surface side) as shown in Figure 2 and cannot be chucked from the back surface side (protection surface side). If the disk 10 is rotated in the improper setting condition, the disk 10 runs about wildly. If the disk is elevated when it is not set on the disk trays 3 properly as shown in Figure 9, the disk is not chucked to the turn table 70 and it may be damaged. However, these improper condition can be detected.

It is not necessary to prepare a both side type for the hub 4 provided at the disk 10 because the improper setting condition can be determined before the disk 10 is chucked. If the front/back mounting condition is detected in response to a presence of a tracking error signal produced when the disk 10 is rotated, the disk 10 should be configured such that it can be chucked from the back side.

The comparison process in the pair of converters 101A and 101B shown in Figure 12 can be executed in a software manner, so that they elements may be omitted and the sensor outputs may be applied directly to the microcomputer 103.

The reflection rate of the protection substrate 6 can be reduced by coloring the protection substrate 6 instead of the scratch-brush finish. It can be considered to mix about three organic coloring matters for coloring the protection substrate 6 black. In this instance, when an infrared ray is used to determine the front/back side, the infrared ray may penetrate through the protection substrate. Carbon

may be added to the black pigment for preventing the infrared ray from penetrating through the protection substrate.

The protection rib 7 is formed at the outer circumference edge of the protection substrate 6 as the single body in the case of Figure 1. However, a ring-shaped member 110 may be adhered as the protection rib to the protection substrate 6 as illustrated in Figure 13. In this instance, the diameter of the protection substrate 6 is slightly larger than the glass substrate 1 and the ring-shaped member 110 is adhered to the extended ring-shaped peripheral of the protection substrate. The material of the ring-shaped member 110 may be the same as that of the protection substrate 6 or another material, such as elastic body, for example, rubber.

If the elastic body is used as the ring-shaped member 110, the shock absorbing effect is improved. Since a disk can be used as the protection substrate 6, the adhesive can be coated by a roller all at once for combining the protection substrate with the glass substrate 1. Therefore, a manufacturing efficiency can be improved very much.

In an embodiment of Figure 14, the diameter of the protection substrate 6 is substantially equal to that of the glass substrate 1 and a ring-shaped member 112 is adhered to the protection substrate 6 so as to cover the outer circumference edge surface of the protection substrate 6 and the outer circumference edge of the glass substrate 1. The length of the ring-shaped member 112 is La.

According to this configuration, an adhesive coating area in the ring-shaped member 112 can be increased and the ring-shaped member 112 can be securely fixed to the protection substrate 6. A spacer 113 may be inserted into a gap between the ring-shaped member 112 and the glass

substrate 1, the coefficient of linear expansion of the spacer 113 being the same as that of the protection substrate 6. The spacer 113 may acts to fix the ring-shaped member 112 certainly. The ring-shaped member 112 may be made of elastic body, such as rubber.

Figure 15 shows a disk where the data can be recorded on both sides thereof. In this embodiment, glass substrates 1 and 1' are combined with both sides of a protection substrate 115 wherein recording surfaces 2 and 2' are provided on the inner surfaces of the glass substrates 1 and 1'. A pair of hubs 4 and 4' are provided at the glass substrates 1 and 1' respectively such that the disk 10 can be chucked from any one of the front and back sides. A protection rib 116 is formed as a body with the protection substrate 115 such that it is projected upward and downward from the outer circumference edge portion of the protection substrate 115 in order to protect the outer circumference edges of the glass substrates 1 and 1', the height of the upper projection portion being equal to that of the lower projection portion.

The protection rib 116 may be formed independently from the protection substrate. In this instance, it is easy to coat the adhesive on the both sides of the protection substrate 115 and this process can be done in a short time.

Figure 16 shows a cartridge 120 which receives the disk 10 having the protection rib. When the disk 10 is used, it is removed from the cartridge 120. The cartridge 120 comprises a main body 122 and an upper cover 123 and an inner wall of the main body 124 prevents the disk 10 from trembling. There may be a small space between the inner wall 124 and the disk 10 because it is difficult to receive the disk 10 if there is no space.

As a result, there is a possibility that the disk 10 is damaged by hitting the inner wall 124. Such a damage can be prevented by providing the protection rib 7 at the protection substrate 6 as shown in Figure 17. The protection rib 7 protects the glass substrate 1 from hitting directly the inner wall 124. This prevents the glass substrate 1 from being damaged.

As being discussed hereinbefore, the present invention covers the outer circumference edge of the medium substrate with the protection rib.

According to the present invention, when the outer circumference edge of the medium substrate receives a shock, such a shock is not given directly to the medium substrate and is absorbed by the protection rib. Thus, the shock proof characteristic can be improved and the medium substrate can be prevented from being damaged by crack and accident. The reliability of the recording medium is improved. The present invention is preferable to be applied to a disk type recording medium, such as a magnetic optical disk used by an AV server and other magnetic optical recording/replaying apparatus.

CLAIMS:

1. A disk type recording medium having at least one disk type recording medium substrate with a signal recording portion at one side thereof, comprising:

a protection member having a circumference portion corresponding to an outer circumference of said recording medium substrate for protecting said recording portion; and

a rib member provided at the outer circumference edge of said recording medium substrate to face it.

2. A disk type recording medium as recited in claim 1, wherein said rib member is provided at the circumference portion of said protection member.

3. A disk type recording medium as recited in claim 2, wherein said rib member is formed at the circumference portion of said protection member as a single body with it.

4. A disk type recording medium as recited in claim 2, wherein said rib member is fixed to the circumference portion of said protection member.

5. A disk type recording medium as recited in claim 2, wherein there is a space between the circumference edge of said recording medium substrate and said rib member, said space absorbing expanded modification of said recording medium substrate and/or said protection member.

6. A disk type recording medium as recited in claim 2, wherein a length of said rib member is selected such that said rib member projects from a surface opposite to a surface of said recording medium substrate on

which said protection member is provided.

7. A disk type recording medium as recited in claim 6, wherein the outer circumference of said rib member has a taper portion at a surface side opposite to a surface of said recording medium substrate on which said protection member is provided and a straight portion continuous to said taper portion at the surface side of said recording medium substrate on which said protection member is provided, and said straight portion limits a mounting position for carrying means for carrying said disk type recording medium.

8. A disk type recording medium as recited in claim 7, wherein a light reflection rate of the surface of said protection member opposite to the surface thereof touching said recording portion is less than that of daid recording medium substrate.

9. A disk type recording medium as recited in claim 1, wherein said recording medium substrate includes said recording portion for replaying or recording/replaying the signal by using a light.

ABSTRACT

A recording film is coated and formed on a glass substrate. A protection substrate is adhered to the glass substrate to cover the recording film. A protection rib is formed as a body with the protection substrate so as to face an outer circumference edge of the glass substrate. Since the external shock is not given directly to the glass substrate by the protection rib, the glass substrate 1 can be protected. Thus, the glass substrate would not be cracked or damaged easily.

FIG.1

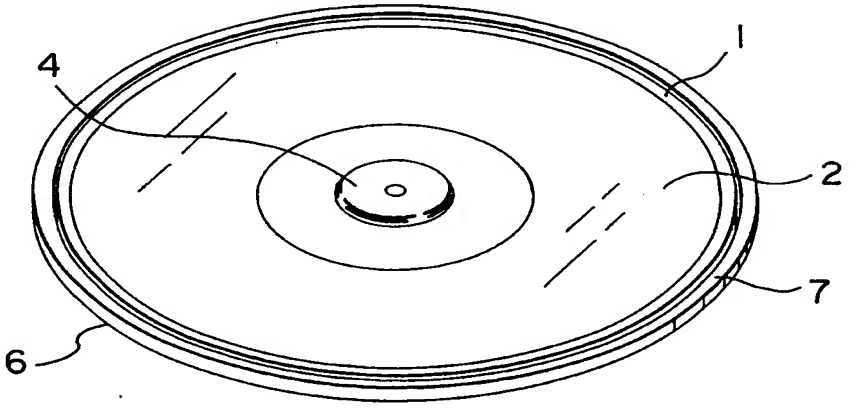



FIG.2

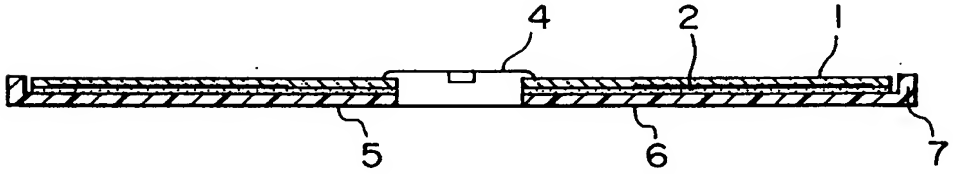



FIG.3

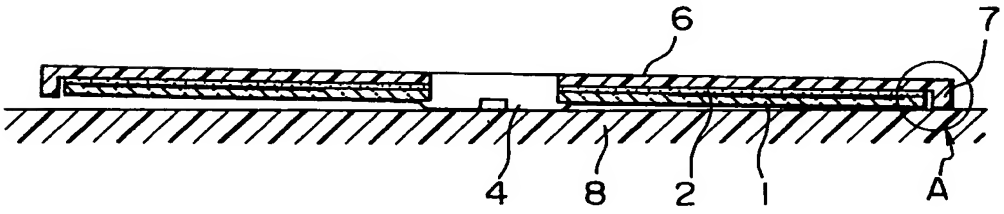


FIG.4

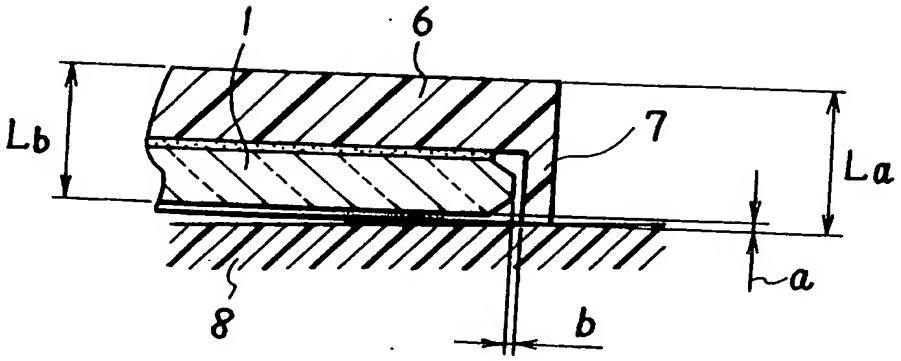



FIG.5

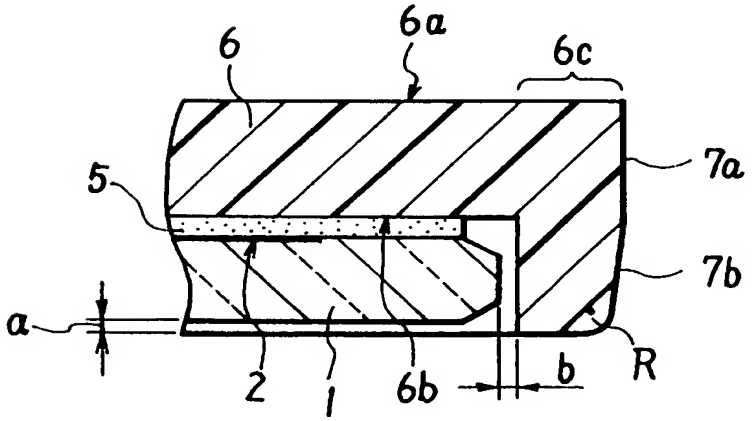
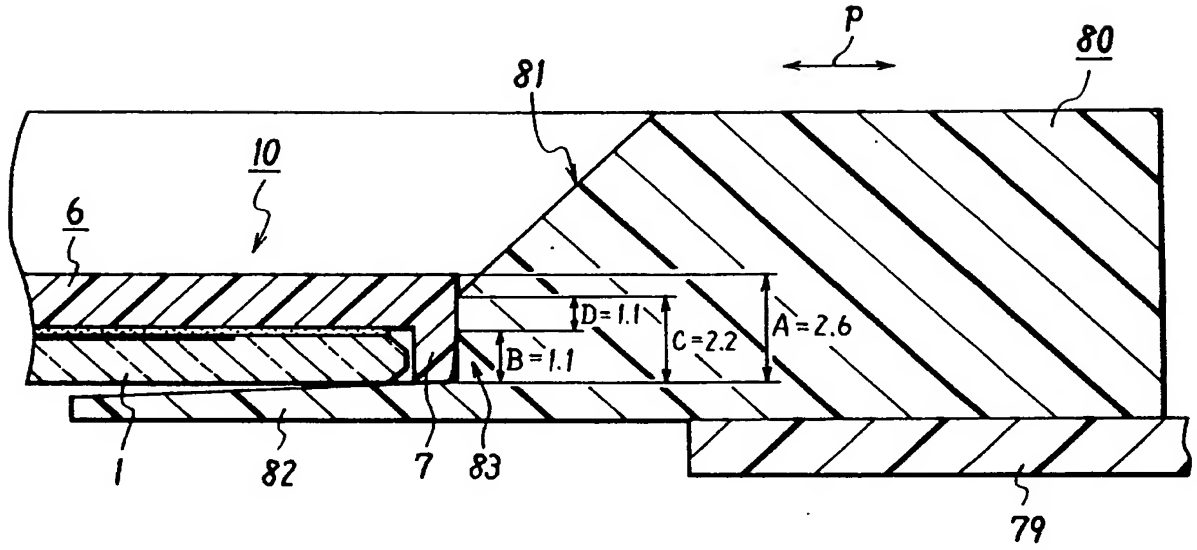


FIG.6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80
81
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6
D=1.1
C=2.2
A=2.6
B=1.1
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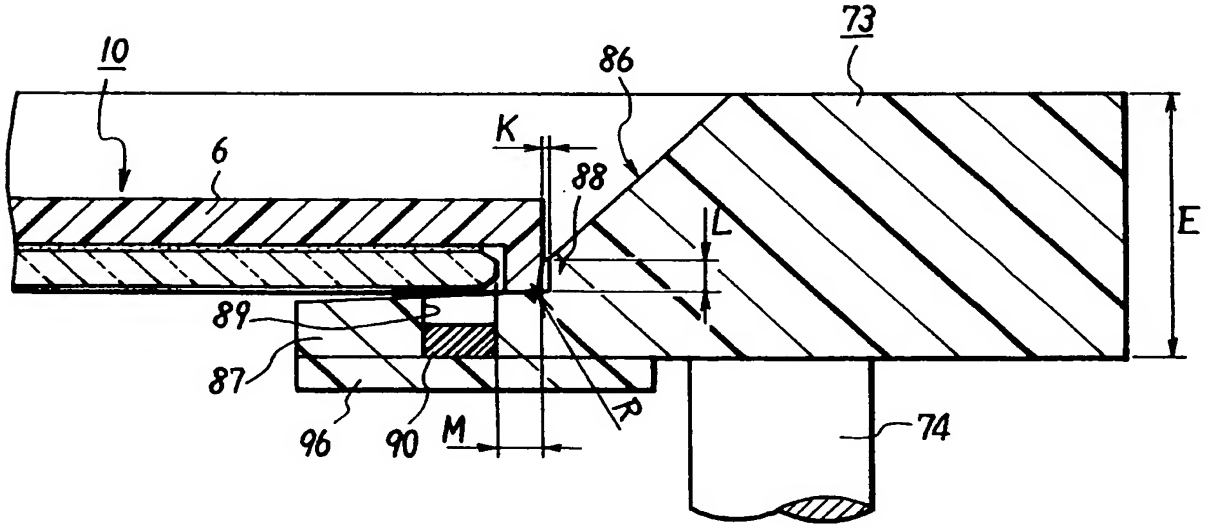
82
7
83
79

FIG.7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90
M
R
74

FIG.8

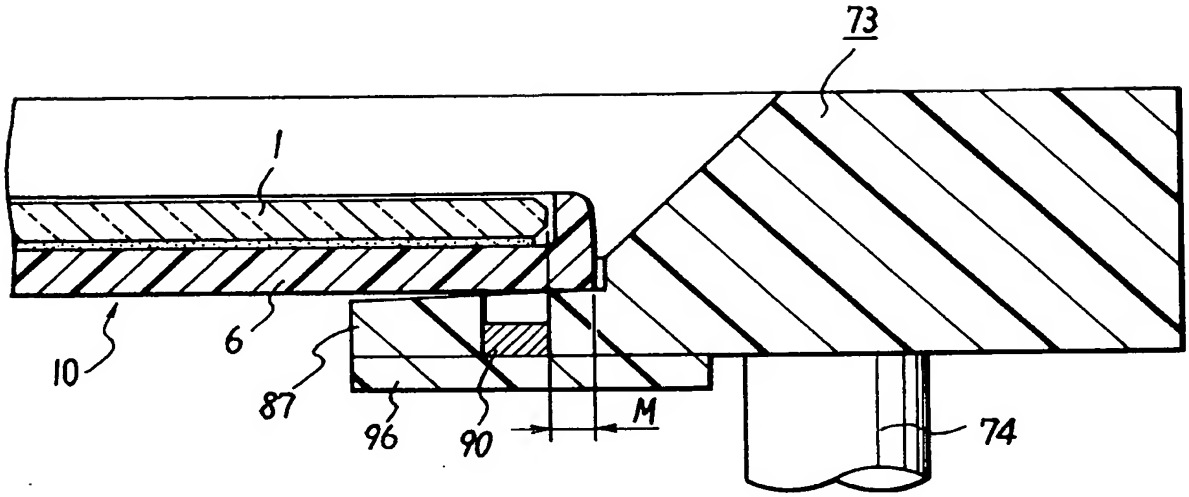


FIG.9

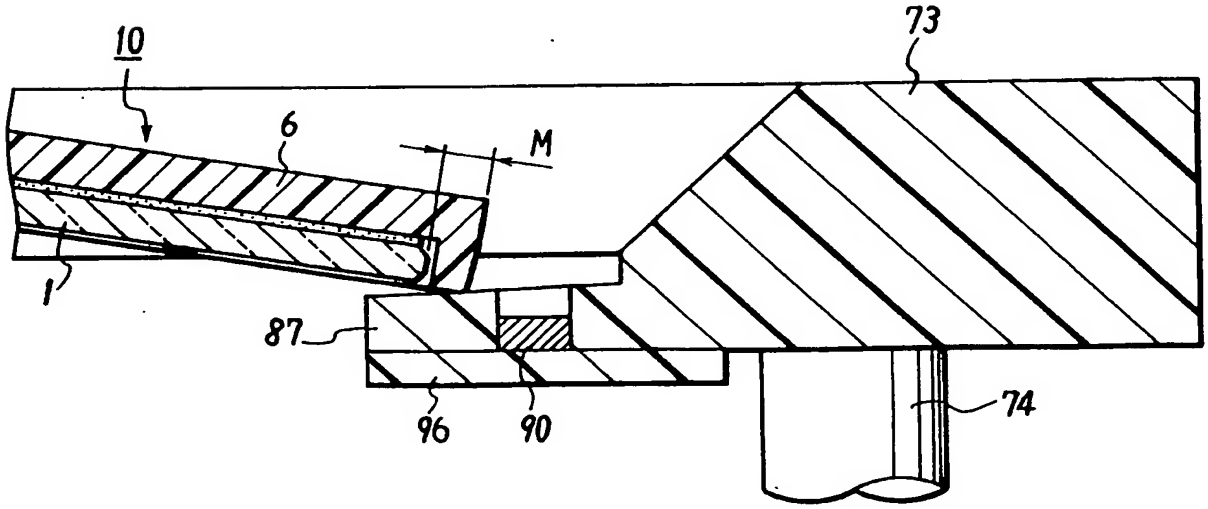

FIG.10

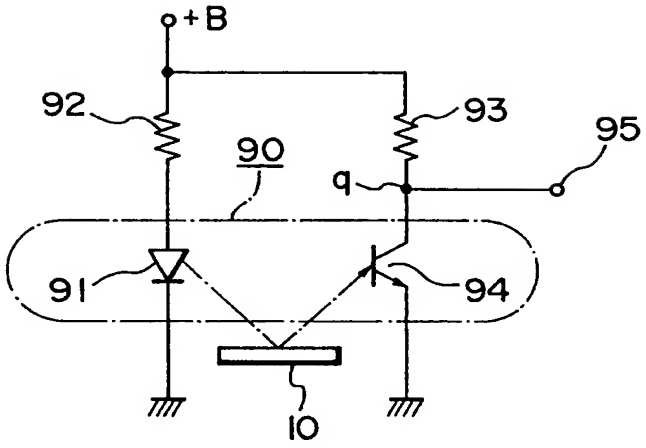


FIG.11

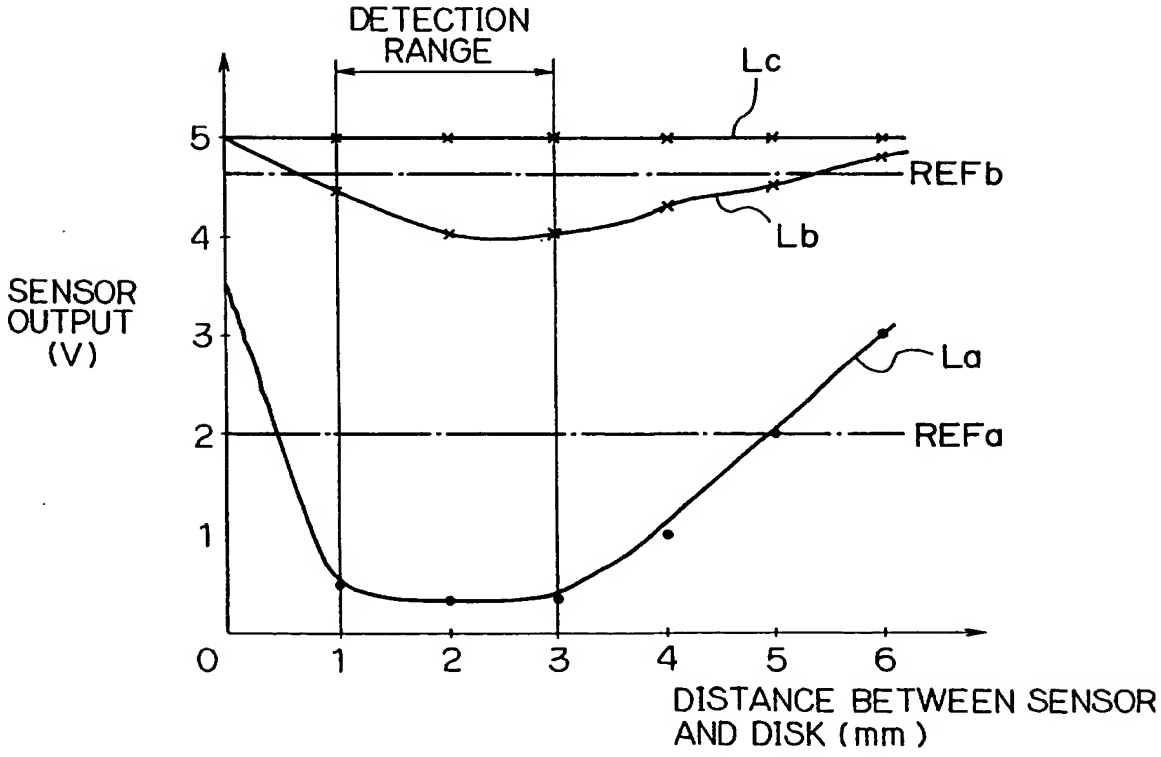

FIG. 12

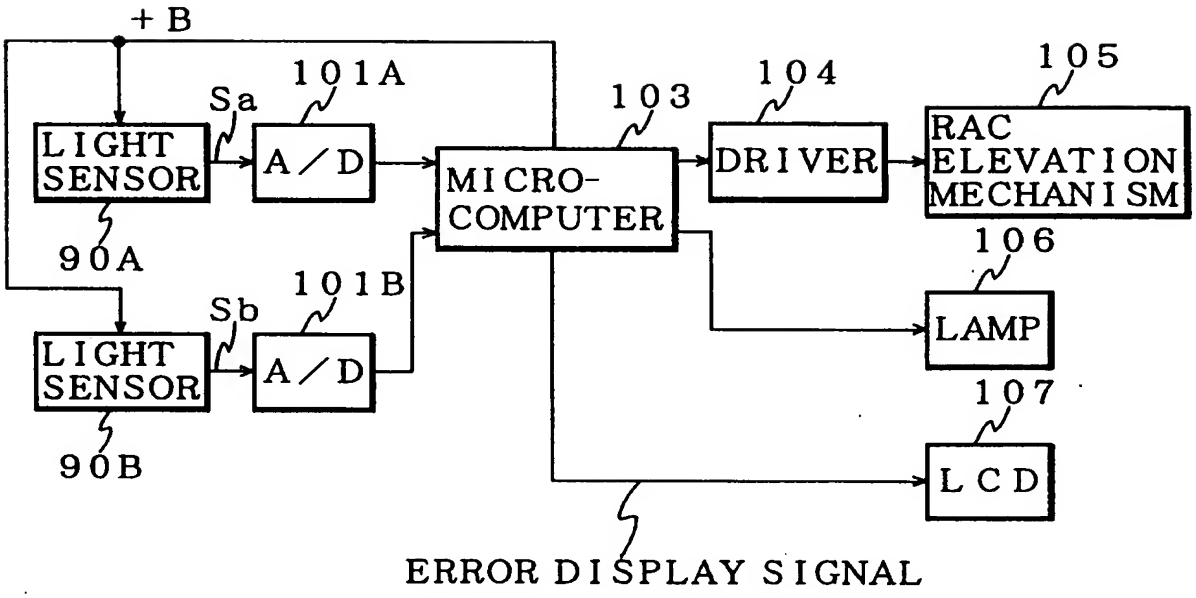

FIG.13

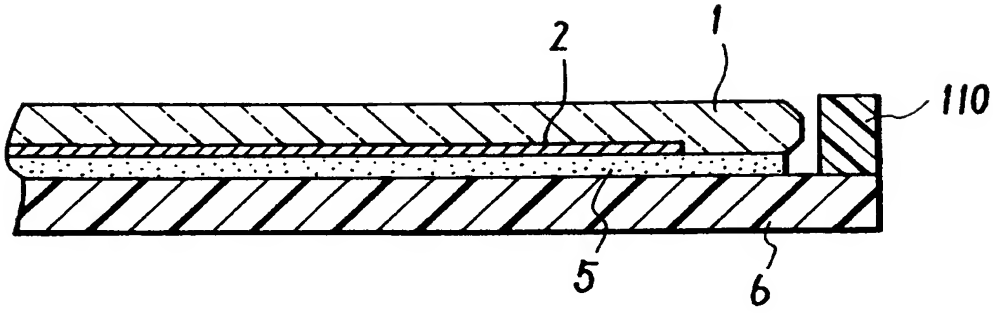


FIG.14

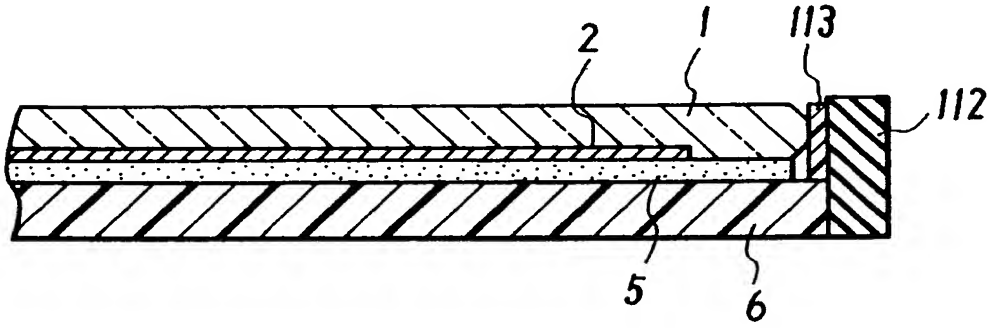

FIG.15

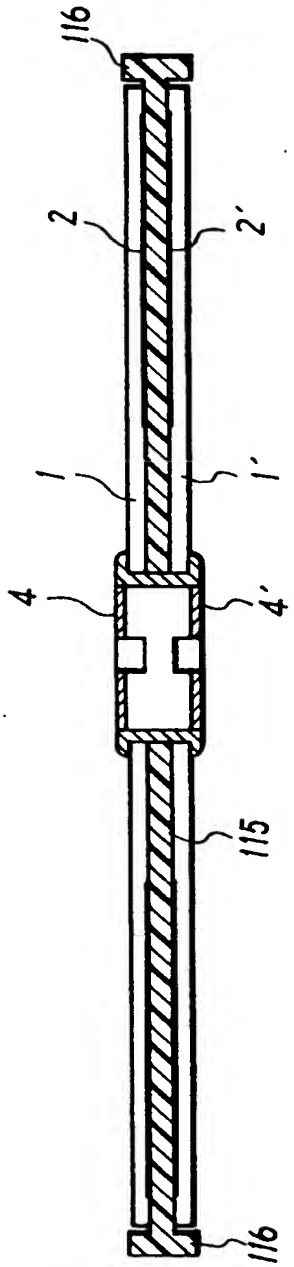


FIG.16

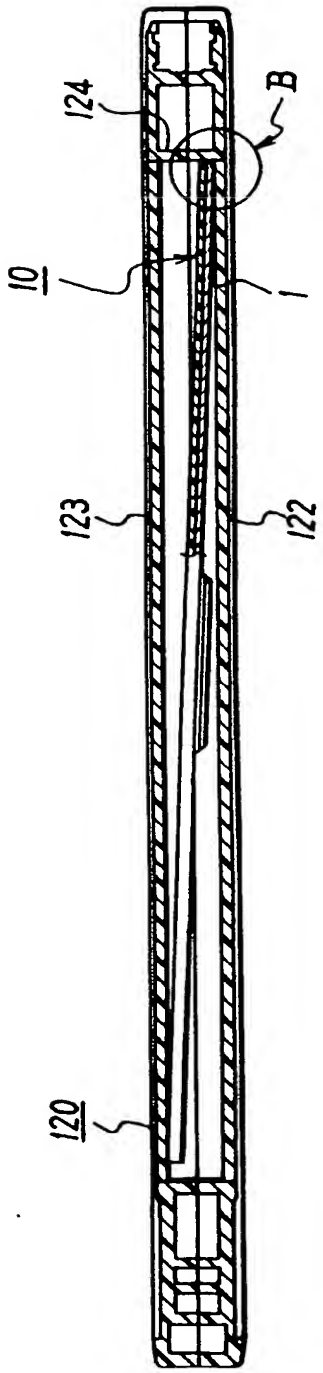

FIG.17

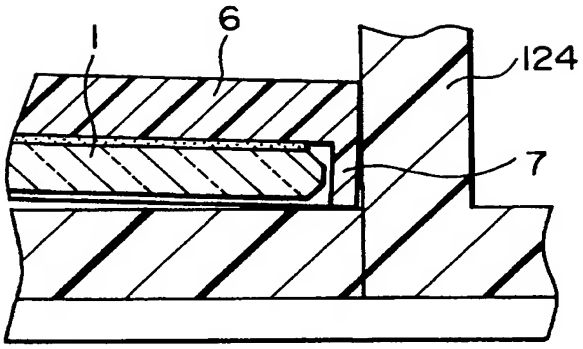


FIG.21

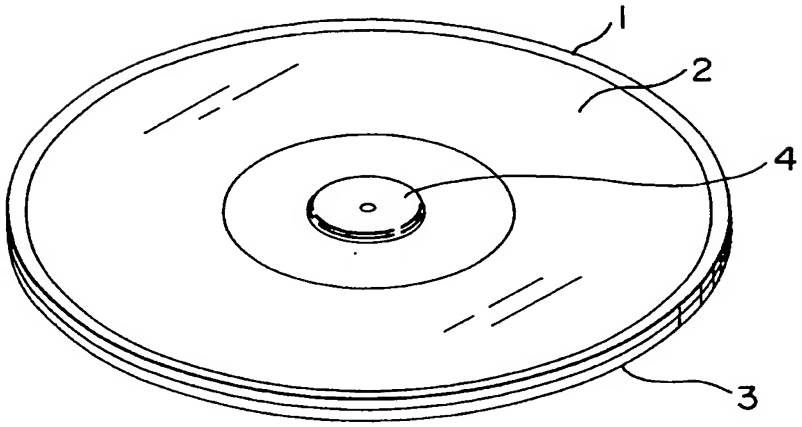


FIG.22

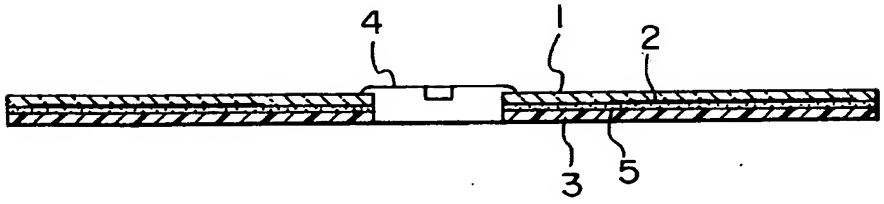

FIG. 18

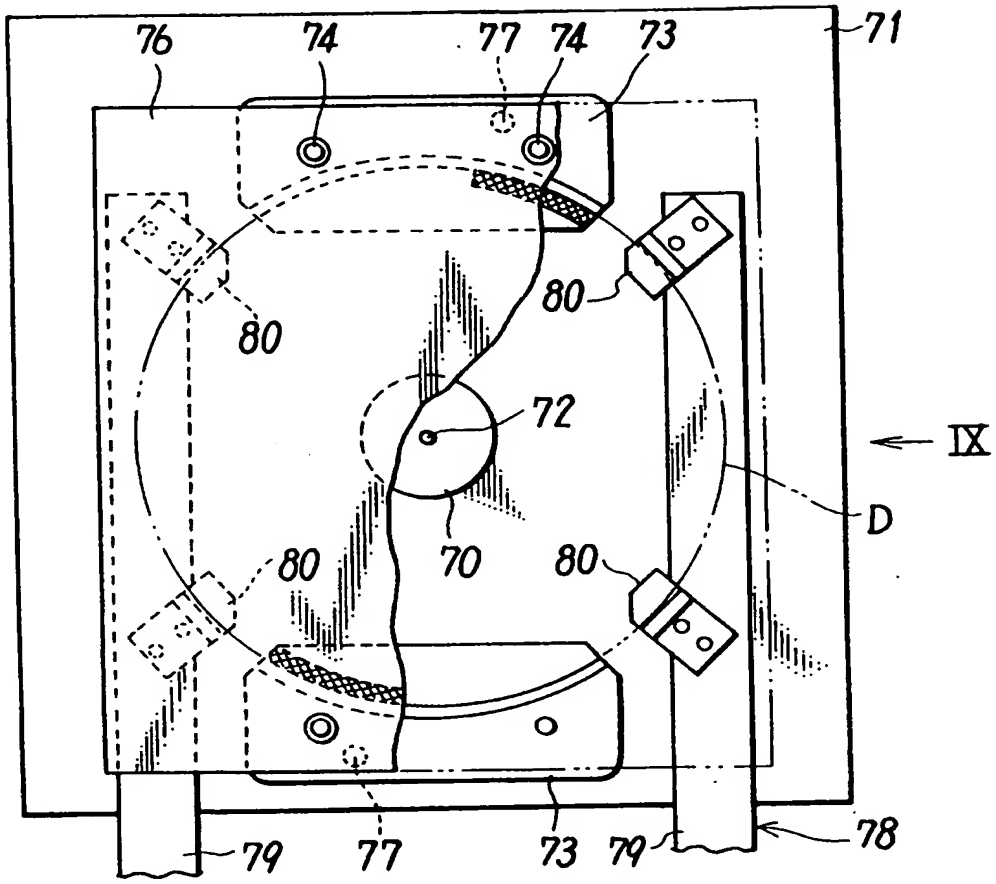
76
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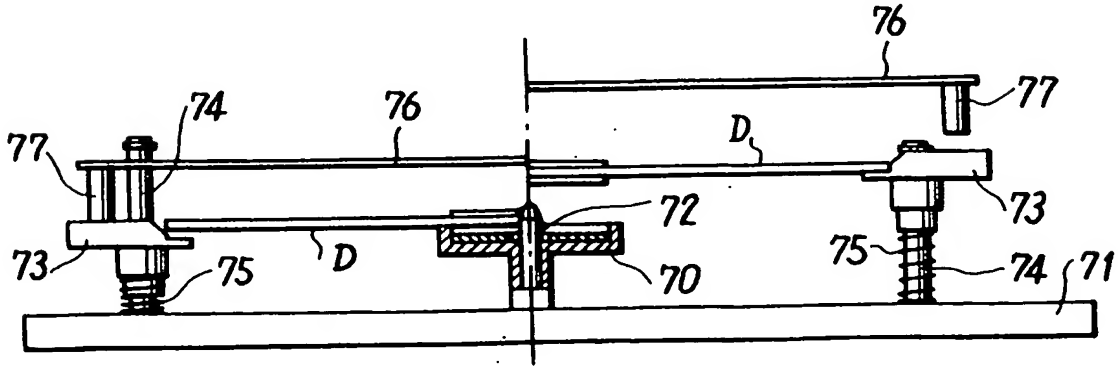
FIG. 19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D
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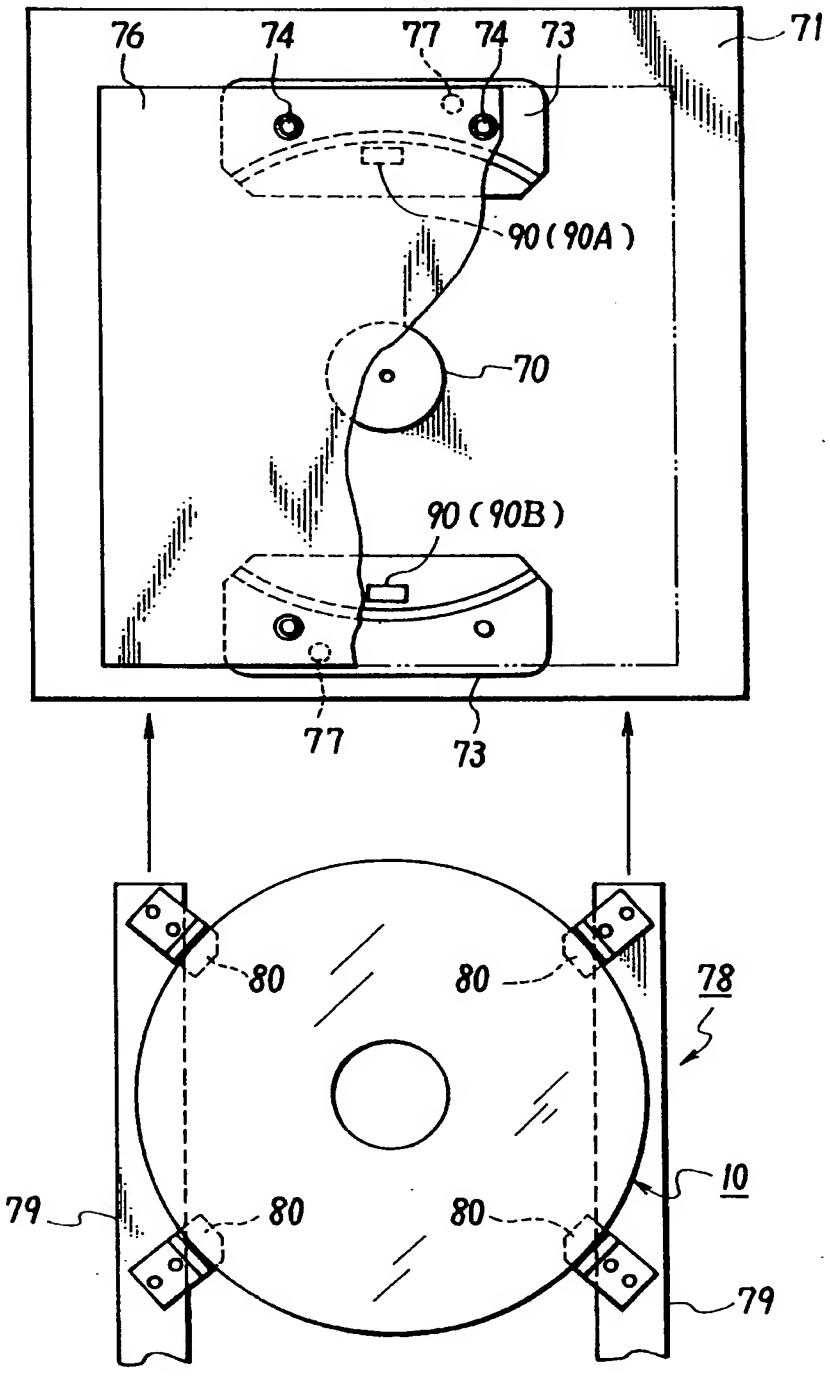
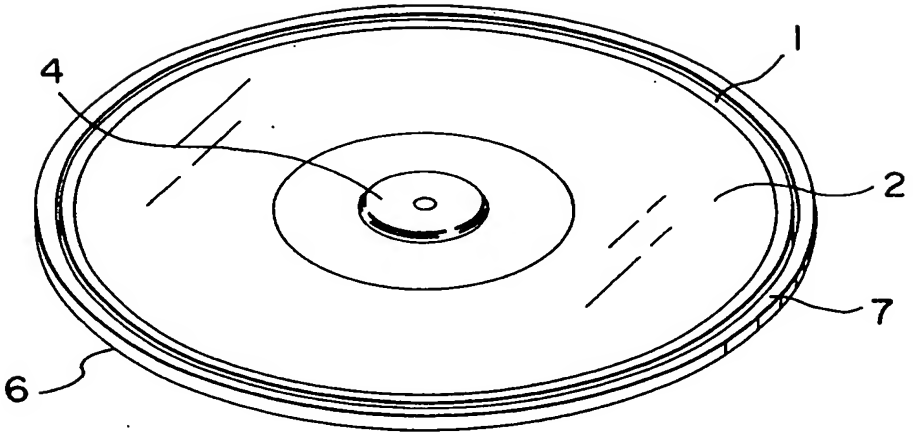
71

FIG.20

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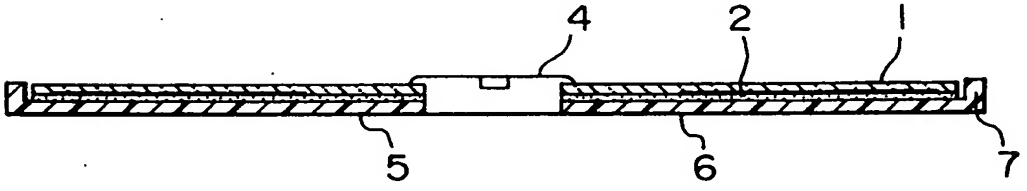
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